

## COMMONWEALTH OF PENNSYLVANIA

---

DEPARTMENT OF INTERNAL AFFAIRS  
James F. Woodward, Secretary

---

BUREAU OF TOPOGRAPHIC AND GEOLOGICAL SURVEY  
George H. Ashley, State Geologist

---

---

## FUTURE OF NATURAL GAS IN PENNSYLVANIA

By

George H. Ashley

---

Trend in Past Ten Years.

The very apparent decline in the production of natural gas in Pennsylvania raises the question as to the supply in the future. How long can we expect to use this fuel for industrial purposes, and for household cooking and lighting? How may the supply be increased or conserved? The natural gas companies with millions of dollars invested in wells, pipe lines, pumping stations, and other equipment are deeply interested in this problem, and equally so are the consumers.

The production of gas in Pennsylvania has ranged in the past ten years from about 108 billion cubic feet to 135 billion cubic feet; depending in large measure on general trade conditions and the demand, for it must be remembered that more than half of the gas used in Pennsylvania is used by industrial concerns. In 1917, the gas production in Pennsylvania reached 133 billion cubic feet which was not far below the maximum production of the State. In 1918, notwithstanding the increased demand, production fell off to 123 billion cubic feet. During these years, Pennsylvania has consumed much more gas than she has produced. In 1910, although producing only 126 billion cubic feet, she consumed 168 billion cubic feet. In 1917, she produced only 133 billion cubic feet, but consumed 202 billion cubic feet. The supply to meet this difference has come, in the main, from West Virginia.

The production in West Virginia steadily increased year by year from 190 billion cubic feet in 1910, to 308 billion cubic feet in 1917. From that maximum the production in 1918 dropped to 265 billion cubic feet and all of the reports coming from that State indicate

that the decline is continuing. In the three states of Pennsylvania, West Virginia and Ohio, the total production has steadily increased from about 364 billion cubic feet in 1910, to 509 billion cubic feet in 1917. From this maximum in 1917, the production dropped 60 billion cubic feet to 449 billion cubic feet in 1918. The peak of production was reached such a short time ago that we have not yet fully realized that the peak has been passed and that the production from now on is almost certain to decrease steadily.

Figures are not yet available for 1919 or 1920, but a careful study of conditions in the field indicates that notwithstanding the bringing in of large wells in places, as at McKeesport, the decline has set in and inevitably will continue.

### Five Sources of Supply.

There are five sources to which we may look for the future supply of natural gas. These are: 1, wells now producing; 2, new wells in old fields; 3, new fields; 4, deeper sands; 5, extension of the Erie County shale-gas field.

Wells now producing. The wells now drilled and producing will continue to supply part of the demand. Many people, however, do not appreciate that a year from now the present wells will be producing only from 75 to 85 per cent as much gas as they do today; that two years from now, they will be producing perhaps only 65 to 75 per cent as much gas as today; that five years from now, they will hardly be producing half as much as they do today and a large number of them will be exhausted and plugged; that ten years from now, their total production will probably be well under one-fourth of the present production and that in thirty or forty years from now, nearly every well now producing will be dead.

New wells in old fields. There are many areas within or adjacent to producing pools that have not been drilled and that undoubtedly will yield gas. Possibly a large part of the additional gas supply to be hoped for must come from wells in these areas. It must be remembered, however, and experience here confirms the theory, that present gas wells are drawing from large areas. Wells at McKeesport drilled one or two miles from the "Big Well" and only six months later, show by the decline in initial rock pressure that half or more of the gas at their location had already been drawn away to the Big Well and others surrounding it.

Practically all of the gas companies report that the average initial flows of new wells are steadily declining. The figures for a group of the largest companies in the State show that in six years, from 1911 to 1917, the average initial flow of new wells declined about one-half. This fact may be viewed in a practical way by considering the conditions facing a company which, let us say, owns leases on 100,000 acres of land on which there are 400 wells, or one well to each 250 acres. In order to keep up the supply of gas to meet the demands on the company, a certain number of new wells must be drilled on that tract each year. These wells will be drilled in

a gas pool which is already partly depleted and the wells drilled next year will be in a pool even more depleted. Therefore, to keep up a consistent supply of gas from a given land area, involves the drilling of an increasing number of wells each year. The cost to the company can easily be seen. Many of the companies which a few years ago held leases on many hundreds or even more than one thousand acres for each producing well, today hold an average of less than 100 acres for a producing well.

The result of drilling in old fields is very clearly seen in the history of some recent wells. It may be recalled that there was considerable excitement in the winter of 1919-1920 when some very large gas wells were brought in near West Newton. The history of these wells shows that within a month or two the flow decreased so rapidly that the gas companies began to wonder if they were going to get back the cost of the pipe lines laid to the wells. This story is repeated with many wells drilled in old fields. It, therefore, becomes a question as to the possibility of striking new pools of gas.

New fields. This brings us to the third possible source of future gas supply, the entirely new fields. Although that part of the State in which we may expect to find gas has been pretty thoroughly tested by the drill, there is a probability that some, perhaps many, small pools are yet to be discovered. The State Survey hopes, before long, to have ready a new oil and gas map of the State which shows that the principal gas fields are fairly close to a line running from the southwest corner of the State past Pittsburgh and Clarion to the northeast corner of McKean County. East of that line the fields decrease in size and importance until east of the Chestnut Ridge anticline the number of producing wells and the production is very small. In the area between the main line of gas pools and the Allegheny Front, however, there are many anticlines that have not yet been thoroughly tested and while it does not seem probable from past experience that these eastern anticlines will yield large quantities of gas, it is possible that some gas will be found on them. Geologists believe that no commercial gas wells will be found east of the Allegheny Front.

Deeper Sands. The fourth source of supply is the deeper sands. Deeper drilling at McKeesport, where gas had been obtained for many years from sands down to the Elizabeth, discovered the very large supply in the Speechley sand several hundred feet lower. There has been much inquiry during 1920 regarding the areal extent of the Speechley and the possibility of there being other undrilled deeper sands below the old fields. There are such sands and the upper ones have proved gas-bearing in many places. From such information as the Survey could obtain from the older official reports, there should be many areas in which the Elizabeth, Speechley, and still deeper Oriskany and Medina sands have not been tested. The investigations now being made by Mr. J. French Robinson of the State Survey, bring out the fact that the recent wide spread testing out of these sands has shown them not so extensive as had been hoped. We know today that no small part of the gas obtained in recent years has been coming from these deeper sands. Doubtless there are other but smaller pools than the McKeesport in deeper sands, but relatively

little gas is to be hoped for unless drilling goes to the very deep Medina or Clinton sand that is yielding gas in central Ohio and along the shore of Lake Erie. Several attempts have been made to reach this sand in western Pennsylvania but so far without success as it is 8,000 or more feet below the surface. It is not, of course, known whether the Medina will prove to contain gas in Pennsylvania.

Extension of the Erie County shale-gas field. The fifth possible source of gas is the Portage shale along the south shore of Lake Erie. Many shallow wells have been drilled into this shale from Cleveland eastward and while the quantity of gas obtained from any one well is very small, the aggregate is of some importance. At present these wells are confined to the low land immediately adjoining the shore. As the shales dip toward the south and the land rises in the same direction, wells drilled farther south will have to be much deeper to reach the same gas horizons. At present, it may be doubted if the gas found in any one well would pay for the cost of this deeper drilling but it may be that in the future the price of gas will reach a point where such deeper drilling will pay. It is not believed that gas obtained in this area will be in sufficient quantity to change the general situation, but it may be one element in retarding the decline and ultimate exhaustion of the gas supply.

How to conserve the supply. Great care should be taken not to rush into legislation shutting off any class of consumers or any particular use of gas. There is a wide spread demand today for the elimination of the industrial use of natural gas. During past years, the industrial use has absorbed approximately 60 per cent of all the gas used in the State. The domestic use has increased from 43 billion cubic feet in 1910 to 63 billion cubic feet in 1917. One phase of the problem that is sometimes overlooked is that the domestic demand for gas is about thirty times larger in February than in July and, in general, is about four times as large through the winter as during the rest of the year. If industrial use of gas is stopped, it will mean that the cost of keeping up the very large equipment necessary to meet the winter demand, must be met entirely by domestic consumers. On the other hand, as the peak load results almost entirely from the use of gas for house heating, it is evident that if this use were eliminated, the load for the whole year would be more evenly distributed, industrial users could be eliminated, and the gas now used by them would become available to other householders for cooking and incidental heating. The first step should be a study of the situation and a classification of the use of gas into necessity uses and luxury uses. Necessity uses would include all domestic or industrial uses for which people will substitute artificial gas if they cannot get natural gas, and luxury uses are those for which people are employing coal rather than artificial gas if denied natural gas at present prices. It must be remembered that the efficient conduct of certain industrial operations requires the use of gas and artificial gas will be used if natural gas is not available.

The State Geologist is now investigating the question of deriving from coal, probably in the form of oil, a fuel to take the place of natural gas for household heating, which by more efficient utilization will supply as much heat as the coal from which it is derived, and should have the advantage of easy manipulation to which people have become accustomed.